

VISUAL OUTCOME IN VARIOUS TECHNIQUES OF NUCLEUS DELIVERY IN MANUAL SMALL INCISION CATARACT SURGERY

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ABSTRACT

The main important goal of modern cataract surgery is early visual rehabilitation by giving near normal vision, minimal induced post-operative astigmatism, rapid mobilization and cost effectiveness, etc. In the advent of paucity of literature, not emerging surgical modern intervention, the health care specialists were drawn an erroneous decision to diagnose the cataract surgeries. Much research work will need to be focused on the surgical intervention and clinical decision about the exposed population. In this juxtapose, the present research paper aims to demonstrate the phacofracture nucleus delivery techniques/method on practical approach for handling the cataract at early stage. A prospective observational study was conducted at Department of Ophthalmology, PESIMSR, Kuppam during 2016–2019. A total of 400 consecutive cataract known patients were selected based on SOP. All cases were randomly chosen and they were undergone any one of the standard operating techniques of nucleus delivery of MSCIS (i) irrigating vectis (ii) phaco sandwich (iii) viscoexpression and (iv) phacofracture. An inclusion and exclusion criteria was employed to select the patients. Inclusion criteria: patients with acquired cataract with age 40 years and above. As per the resulted findings there is no statistical significant difference ($p < 0.001$) achieved in visual acuity at first operative day for all grades of cataract among the four study groups. By the 7th day, the visual acuity of 6/12 or shown better results (86%) in the phaco sandwich group, 79% in the vico expression group, 75% in the irrigating vectis group and 72% in the phacofracture group. After one month postoperative period of all four groups can yield better results, only less orientation results were seen in phacofracture group ($p > 0.01$). In the management of senile immature cataracts viscoexpression gave the best results with more number of patients had good visual acuity. However visco expression is a safe and effective technique for soft cataracts.

KEYWORDS: Cataract Surgery, Visual Outcome, SAS & Post Operative

Received: Sep 02, 2019; **Accepted:** Sep 25, 2019; **Published:** Nov 21, 2019; **Paper Id.:** IJMPSDEC20198

INTRODUCTION

Opacity in the lens or its capsule, whether developmental or acquired is called a cataract. The cataract is one of the leading causes of avoidable blindness in worldwide and more epidemic in developing countries such as India [1]. Since, blindness is a major public health problem associated with decreased life expectancy. No methods to alter the formation of a cataractous lens have shown to be effective [2]. In mid 19th century, we roughly estimated 37 million peoples were blind at worldwide, of which 40% of cataract [1–3]. The prevalence has been shown to be increase with age and geographical area due to climatic changes, it is a significant global problem in 21st century [3]. Currently 20 million people have severely reduced vision due to cataract and drew up 40 million by the year 2020 [4]. The correction measures to be undertaken at the right time in many areas of developing countries,

especially for exposed population, it is one of the real challenges and issues intact in developing countries for management of public health problems [5]. The surgical option is readily available in India viz capsular cataract extraction (ECCE), manual small incision cataract extraction and phaco emulsification, etc. However, the surgical services need to be accessible, affordable and cost effective for good vision rehabilitation. Manual small incision cataract surgery is the best way for removing the large back log of cataract surgery in developing countries, by its universal applicability, short operating time, cost effectiveness, suture less incision, lesser surgical complications, short learning curve and reduced post operative hospital stay [6–7]. The main important goal of modern cataract surgery is early visual rehabilitation by giving near normal vision, minimal induced postoperative astigmatism, rapid mobilization and cost effectiveness. In the advent of the paucity of literature, not emerging surgical modern intervention, the health care specialist very difficult to draw designs on the diagnosis and operate cataract surgeries. Many research works need to be focused on surgical intervention and clinical decision about the exposed population. In this juxtapose, the present research paper aims to demonstrate the phacofracture nucleus delivery techniques/method on practical approach for handling the cataract at early stage.

METHODS

A prospective observational study was conducted at Department of Ophthalmology, PESIMSR, Kuppam during 2016–2019. A total of 400 consecutive cataract known patients were selected based on SOP. All cases were randomly chosen and they were undergone any one of the standard operating techniques of nucleus delivery of MSCIS (i) irrigating vectis (ii) phaco sandwich (iii) visco expression and (iv) phacofracture. Inclusion and exclusion criteria were employed to select the patients. Inclusion patients with acquired cataract with age 40 years and above, exclusion; any complicated cataract, ocular conditions like corneal opacity, glaucoma, miotic pupil, diabetic retinopathy, hypertensive retinopathy, pre-existing macular disorder, cataract with pseudo exfoliation and intraoperative complications like vitreous loss, iris prolapsed. Each selected patients are subjected to obtain detailed history by the following routine investigations done by RBS, IOP and lacimal syringing. The special investigations were done at greater accuracy and we have obtained the data a) visual acuity, b) Slit lamp examination, c) Ophthalmoscopic examination, d) A scan biometry, and e) B-Scan (if required). The collected data were analyzed by using SAS statistical software, multiple logistic regression model was employed to test the hypothetical results.

RESULTS

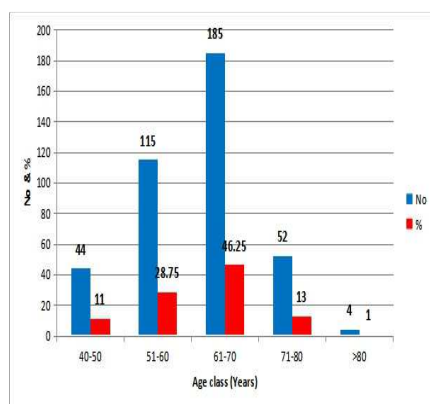


Figure 1.1: Age Wise Distribution.

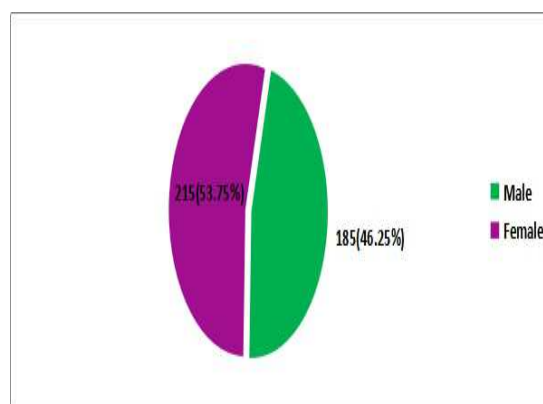


Figure 1.2: Gender Wise Distribution.

The mean age was 63.06 ± 8.48 years, sex ratio was 185/215 (1:1). The male comprises 185(46.25%) and female was 215(53.75%). The mean LOP of LE/RE was 17.28 ± 2.84 and 17.33 ± 2.86 , respectively. The results found that there

is no statistical significant difference between IOP of both left and right eye ($p < 0.01$). Pre operative vision was recorded and the relation was correlated by paired t test, majority of cases laterality correlated the distance between CF 1 meter 61(15.25%) and less was CF 1/2meter 05 (1.25%), CF 2 (14.75%), 3 meter 38 (9.50%), CF 4 meter (5.75%) , CF 5meter (4.25%) , CF 6 meter 58 (14.10%) and hand movement (10.72%) was found to be statistically significant with respect to IOP.

Table 1.1: Pre Operative Vision and Laterality Correlation with respect to IOP

Pre Op Vision	No	IOP		Eyes	
		Mean	SD	LE	RE
CF 1 1/2 MTS	05(1.25%)	16.6	2.07	05	00
CF 1 MTR	61(15.25%)	16.18	2.22	29	32
CF 1/2	35(8.75%)	17.42	2.73	16	19
CF 2 MTS	59(14.75%)	15.81	2.76	30	29
CF 3 MTS	38(9.50%)	17.05	2.07	12	26
CF 4 MTS	23(5.75%)	17.00	1.75	10	13
CF 5 MTS	17(4.25%)	15.47	2.03	05	12
CF 6 MTS	58(14.50%)	16.05	1.31	25	33
CF CF	15(3.75%)	17.73	2.32	09	06
HM	34(8.50%)	18.73	2.53	14	20
HM +	07(1.75%)	21.00	2.23	03	04
PL	32(8.00%)	19.08	3.44	15	17
PL +	15(3.75%)	22.18	1.16	04	11.00
SMC	01(0.25%)	23.00	0.00	00	01
Total	400	18.09	2.044	177	223

Table 1.2: Nuclear Surgery Overview and Characteristics

Nuclear	Male	Female	Age Mean \pm SD	P-value
Irrigating vectis	46	54	62.28 \pm 8.14	≤ 0.001
Phaco fracture	46	54	63.77 \pm 7.58	≤ 0.001
Sandwich	46	54	62.19 \pm 9.59	≤ 0.001
Visco expression	46	54	63.49 \pm 8.84	≤ 0.001
Total	184	216	62.15 \pm 8.03	

From table (1.2) depicted that nuclear surgery overview with respect to age of the patient, the resulted findings was correlated by logistic regression analysis model, it was showed that irrigating vectis, phaco fracture, sandwich and Visco expression was to be attained the age was 62-63 years (IQR 59-65) with mean age was 62.15 \pm 8.03. All nuclear surgery was found to be statistically significant ($p < 0.001$).

Table 1.3: Group wise Laterality Break up (n = 400)

Nuclear	RE (No) (n = 223)	LE (No) (n = 177)	IOP Mean \pm SD	P-Value
Irrigating vectis	56	44	17.73 \pm 2.92	≤ 0.0011
Phaco fracture	55	45	17.42 \pm 2.62	≤ 0.0326
Sandwich	52	48	17.25 \pm 2.81	≤ 0.0012
Visco expression	60	40	16.86 \pm 2.86	≤ 0.0038
Total	223	177	17.02\pm2.65	

From table (1.3) depicted that nuclear surgery, eyes of the (RE/LE) and IOP correlation was done by the unpaired t test, the results showed thatthe irrigating vectis, phaco fracture, sandwich and Visco expression was to be attained the

mean IOP was 16–17 (IQR 14–18) with mean IOP was 17.02 with SD 2.65. All nuclear surgery was found to be statistically significant ($p < 0.001$) with RE/LE in association with IOP.

Table 1.4: Correlation between Nuclear Deliveries with Associated Parameters

Nuclear	No	Lids	Conjunctiva	Cornea	Anterior chamber	IRIS	Pupillary dilatation
Irrigating vectis	100	No	No	No	No	No	8
Phaco fracture	100	No	No	No	No	No	8
Sandwich	100	No	No	No	No	No	8
Visco expression	100	No	No	No	No	No	8
Total	400						

Table 1.5: Correlation between Nuclear with age, IOP and RE, LE

Nuclear	Male	Female	Age Mean \pm SD	RE (No)	LE (No)	IOP Mean \pm SD	P-Value
Irrigating vectis	46	54	62.28 \pm 8.14	56	44	17.73 \pm 2.92	≤ 0.0011
Phaco fracture	46	54	63.77 \pm 7.58	55	45	17.42 \pm 2.62	≤ 0.0326
Sandwich	46	54	62.19 \pm 9.59	52	48	17.25 \pm 2.81	≤ 0.0012
Visco expression	46	54	63.49 \pm 8.84	60	40	16.86 \pm 2.86	≤ 0.0038
Total	184	216	62.15 \pm 8.03	223	177	17.02 \pm 2.65	

From table (1.5) depicted that nuclear surgery, eyes of the (RE/LE), IOP and gender matched analysis was done by the multivariate analysis, the results showed that the irrigating vectis, phaco fracture, sandwich and Visco expression was attained the mean IOP was 17.02 SD 2.65 with mean age was 62.15 SD 8.03. All nuclear surgery was found to be statistically significant ($p < 0.001$) associated with age and RE/LE.

Table 1.6: Correlation between Nuclear with age, IOP and RE, LE

Nuclear	Posterior Capsule	Pciol Position	Post Operative Vision			P-value
			Day1	1 Week	1 month	
Irrigating vectis	I	B	0.44 \pm 0.20	0.31 \pm 0.14	0.14 \pm 0.13	≤ 0.011
Phaco fracture	I	B	0.47 \pm 0.20	0.32 \pm 0.013	0.16 \pm 0.15	≤ 0.086
Sandwich	I	B	0.42 \pm 0.19	0.26 \pm 0.11	0.11 \pm 0.85	≤ 0.032
Visco expression	I	B	0.43 \pm 0.15	0.30 \pm 0.16	0.13 \pm 0.12	≤ 0.001
Total	I	B	0.45\pm0.12	0.28\pm0.14	0.16\pm0.13	

From table (1.6) depicted that nuclear surgery and post operative vision follow up analysis was done by ANOVA, day 1 the post operative vision of Irrigating vectis was found to be statistically significant ($p < 0.0111$) with mean POV at the end of the 1 month was 0.14, SD 0.13. In case of phaco fracture at the day 1 mean of POV was 0.47, SD 0.20 at the end of 1 month 0.16, SD 0.15, similar findings were notice in Visco expression the mean of POV was 0.45, SD 0.12 at initial day at the 1 month the mean POV was 0.16, SD 0.13. All surgical intervention was found to be statistically significant. As per the resulted findings phaco fracture is less associated with yielding good vision.

Table 1.7: Significance of different Lenses with Respect to Nuclear

Nuclear	Cortical lens										Total
	0	%	1	%	2	%	3	%	4	%	
Irrigating vectis	33	8.25	18	4.5	17	4.25	4	1	28	7	100
Phaco fracture	36	9	17	4.25	16	4	5	1.25	26	6.5	100
Sandwich	38	9.5	20	5	18	4.5	6	1.5	18	4.5	100
Visco expression	38	9.5	22	5.5	21	5.25	2	0.5	17	4.25	100
Total	145	36.3	77	19.25	72	18	17	4.25	89	22.25	400
Chi-square	19.85										
P-value	P = 0.0002										

Table 1.8: Significance of different Lenses with respect to Nuclear

Nuclear	Nuclear Lens										Total
	0	%	1	%	2	%	3	%	4	%	
Irrigating vectis	-	0	9	2.25	39	9.75	26	6.5	26	6.5	100
Phaco fracture	-	0	8	2	43	10.75	25	6.25	24	6	100
Sandwich	-	0	10	2.5	47	11.75	22	5.5	21	5.25	100
Visco expression	-	0	12	3	40	10	30	7.5	18	4.5	100
Total		0	39	9.75	169	42.25	103	25.75	89	22.25	400
Chi-square	21.55										
P-value	0.0089										

Table 1.9: Significance of different Lenses with respect to Nuclear

Nuclear	PSCC										Total
	0	%	1	%	2	%	3	%	4	%	
Irrigating vectis	48	12	9	2.25	30	7.5	10	2.5	3	0.75	100
Phaco fracture	36	9	16	4	36	9	10	2.5	2	0.5	100
Sandwich	35	8.75	13	3.25	41	10.25	10	2.5	1	0.25	100
Visco expression	32	8	20	5	36	9	11	2.75	1	0.25	100
Total	151	37.8	58	14.5	143	35.75	41	10.25	7	1.75	400
Chi-square	26.82										
P-value	0.00011										

Table 10.1: Uncorrected Visual out come on Post Operative day 1

VA on POD 1	UCVA on POD1			Total
	Good(0-0.3)	Moderate(0.5-0.8)	Poor (>=>1.00)	
Irrigating Vectis	46	51	3	100
Phaco fractire	34	64	2	100
Sand Witch	46	54	0	100
Visco expression	43	56	1	100
Total	169	225	06	100
Chi-square	5.5, p=0.4830			

Table 10.2: Un Corrected Visual out come on Post Operative Day 7

VA on POD 1	UCVA on POD1			Total
	Good(0-0.3)	Moderate(0.5-0.8)	Poor (>=>1.00)	
Irrigating Vectis	75	25	0	100
Phaco fractire	72	28	0	100
Sand Witch	86	14	0	100
Visco expression	79	21	0	100
Total	312	88	0	100
Chi-square	14.26, p = 0.00006			

Table 10.3: Best Corrected Visual out come on Post Operative one Month Period

VA on POD 1	UCVA on POD1			Total
	Good(0-0.3)	Moderate(0.5-0.8)	Poor (>= >1.00)	
Irrigating Vectis	96	4	0	100
Phaco fractire	94	6	0	100
Sand Witch	96	4	0	100
Visco expression	98	2	0	100
Total	384	16	0	100
Chi-square	14.26, p = 0.00006			

By irrigating vectis techniques 96 case were attained good BCVA (6/6 to 6/12), 4 cases were attained moderate visual acuity, none of the patients not recorded poor visual acuity ($\geq 6/60$). By phaco fracture techniques 94 cases were attained good BCVA (6/6 to 6/12), 6 patients were showed moderate Visual acuity, none of the patients not showed poor visual acuity. In case of sand witch techniques 96 cases were good BCVA and 4 cases moderate visual acuity, lastly in case of visco expression techniques 98 cases were attained good BCVA, 2 patients were attained moderate. VA and the results were found to be statistically significant ($p < 0.001$)

DISCUSSIONS

The study comprises of 400 consecutive patients who satisfied the inclusion and exclusion criteria and cases were undergone manual small incision cataract surgery. These cases were categorised into four groups (each 100 cases). The first group underwent SICS by irrigating vectis techniques, the second group by Phacofracture techniques, the third group by Phacosandwich and final group by visco expression techniques, respectively. The final results of visual acuity were studied on 1st, the 7th and the 30th post operative days. As per the resulted findings the mean age of the patients IQR range was 61–64 years, more cataract incidence was males and significantly associated with elderly population, our results similar to the study done by Rahman et al., he also categorised 25 patients of irrigating vectis group 6(24.%) patients achieved uncorrected good visual acuity (6-6-6/12), 18(72.0%) patients achieved uncorrected moderate visual; acuity (6/18-6/36) and 01 (0.40%) case had uncorrected poor visual acuity on the first operative day of surgery. In our study findings among 100 cases of irrigating group 46(46.0%) patients had successfully achieved the good visual acuity (6/6-6/12) 51.0% of patients had achieved uncorrected moderate visual acuity (6/18–6/36) and 3.0% had uncorrected poor visual acuity on the first post operative day of surgery respectively. The findings were correlated in phacofracture group and 16.0% of patients had achieved uncorrected good visual acuity, 56% of patients had achieved uncorrected moderate visual acuity and 28.0% cases had uncorrected poor visual acuity was noticed similar study put forth by Hepson *et al.*, Khan MT *et al.* The visual outcome and complications of manual sutureless small incision cataract surgery showed final best corrected visual acuity at six months postoperative period, it was $\geq 6/18$ in 86.80% of cases as compared to pre operative VA ($\leq 6/16$) in 82.0% of eyes. Astigmatism was noticed and it was significantly higher in the incidence (50%). This study proved that the course of time has no significant effect on the final amount of post op astigmatism in eyes operated by manual SICS. Gogate et al using irrigating vectis techniques in SICS gives good uncorrected visual acuity in comparative of ECCE. Of 348 patients operated by this technique 47.90% had uncorrected visual better than 6/18 in comparison to 37.30% achieved by ECCE. One more study reported in Indian context done by Venkatesh et al., in a non comparative interventional case series, he reviewed the surgical outcomes of 593 cases, reported a total of 491 cases (94.41%) significantly achieved BCVA of 6/18. Twenty-one patients (4.0%) achieved 6/24 to 6/60 and eight patients (1.60%) had 6/60 vision. Our study matched with the previous studies for the post operative best corrected visual acuity at six weeks.

CONCLUSIONS

The summing of the results concludes that, the phaco fracture techniques are associated with poor vision in the early post operative period due to corneal complications. This was primarily due to collapse of the anterior chamber while fracturing the nucleus. This can be overcome by maintaining the AC by continuously injecting visco elastic material during the step of fracturing the nucleus in the AC. When four techniques were compared at post operative day 1 there was not found to be statistically difference in uncorrected visual acuity among the four groups. Visco expression gave the best results with

more number of patients with good visual acuity. Since visco expression is a safe and effective technique for soft cataract phaco sandwich and irrigating vectis techniques also gave comparable results with fast visual recovery.

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